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The use of modern information technology in tourist information systems on the example of city of Czestochowa

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Abstract

The article presents considerations conducted to demonstrate how important is information these days, when we are faced with the great social and technological challenges. The aim of the discussion was to gain knowledge about the degree of use of information technology to create a modern and functional tourist information system on the example of city of Czestochowa. The study was based on the idea of the need to implement measures aimed at the development and improvement of tourist information systems. Methodological basis for discussion was the analysis of the literature and case study. Results of study conducted on a real dataset illustrate effectiveness of the proposed method.

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Keywords: information technology, tourism information system,

1. Introduction

Obtaining and collecting tourist information in today's circumstances is generally not easy. There is one key factor, which is a cause of this: the development of technology that results in a rapid increase in the complexity and speed of processes, while increasing the requirements for the quality and accuracy of their implementation. Hence, it becomes necessary to use appropriate information technology.

Tourist information is one of the most important elements of tourism infrastructure. One cannot have an effective promotion of the region, if it is not supported by an efficient information system. Tourist information systems designed by know are subject to continuous development. One could say that the use of information technology is part of the strategy of development of such systems.

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The aim of the discussion was to gain knowledge about the degree of use of information technology to create a modern and functional tourist information system on the example of city of Czestochowa. It is mainly due to the use of modern information technologies in the system, that many useful and interesting services, which found to be very popular among the tourists and pilgrims visiting the city, could be launched.

Currently the system serves mainly as the source of information, which is regularly improved and modernized. Part of the system concerning software, including website which is a business card of the project, was improved many times in order to achieve the best functionality, clarity and visual appeal, thereby going to meet the expectations of users.

So far, the system was a carrier of tourist, cultural, local government and business information. Thanks to it, residents and tourists have the opportunity to gain access to the latest events in the city. Therefore, the amount of people using the system and information kiosks has been steadily growing. Among them are mainly young people who use latest technology every day. The city, having held such an extensive network of information kiosks, meets people who do not have access to modern means of communication, thus preventing the so-called " eInclusion".

Several years of operation of the system has led to many interesting insights, both in the use of technical solutions and software. They can be useful both in its further development as well as in the creation of a new system from the ground up by other cities or regions that will want to use this type of tools to promote their values. Applied solutions have proven to be useful and helpful to tourists and residents, which is confirmed by more than 320 000 entries per year from information kiosks. They also contributed to the steady all year long use of the system, which previously was used mostly in tourism and pilgrimage season, i.e. between April and September.

In this regard, based on theoretical considerations regarding the information, the information system and information technology, and applied information technologies used to create a tourist information system have been presented. The article ends with reflections on the need and rationale of these solutions.

The study was based on the idea of the need to implement measures aimed at the development and improvement of tourist information systems. Methodological basis for discussion was the analysis of the literature and case study.

The organization of the article is as follows: in section 2 and 3 definitions and concepts of information, information system and information technology were quoted. Applied information technologies used to create a modern tourist information system in Czestochowa were presented in sections 4 and 5. Finally, in Section 6, which summarizes a paper the purposefulness and appropriateness of the solutions were discussed.

2. The nature and importance of information

The concept of information has not been defined unambiguously yet[1]. The interpretation of this word cause a lot of trouble in terminology and agreement between professionals in this area can be reduced to saying that there is no strict, unambiguous and comprehensive definition of information[2]. The researchers often abandon analyzing the definition of the term, and stay with intuitive, common understanding, or supplementing it with auxiliary terms[3].

N. Wiener[4], as the father of cybernetics, introducing the concept of information, stated "(...) it is the name of the contents of the external world."

In turn, R. Ashby[5], contented himself with saying that "(...) information is a transfer of diversity", and S. Beer[6], author of one of the first work on applications of cybernetics in management, although in his work often refers to the concept of information - did not specify it.

Polish Standard PN-71-T-01016 adopted the term, according to which "information is the meaning (content) used in the relevant conventions assigned to data"[7] and E. Niedzielska cites French saying that: "With no matter, there is nothing, without power all is still, with no information there is chaos."[8]

In any case, it is true to say that, the information is a factor increasing the knowledge of reality. The aim should be to achieve full knowledge on the topic, which in the case of huge complexity of the problem is in fact impossible.

Information theory states that lack of knowledge is the greater, the greater the complexity and diversity of considered fragments of reality. In general, a gap between the full knowledge and the knowledge generally available is formed[9].

The superior goal of information is to provide news from news source to the object of their destination. Forwarding a message consists of sending them in space from one place to another or moving it in time (remembering, recording)[10].

The value of information affects its completeness and accessibility. There is no information that can be universally useful. It is a particular situation that determines what is its degree of accuracy or form, whether the

scope and sources are correct. The value of information depends to a large extent on the recipient, since he determines the extent the information adds to the knowledge possessed by him.

3. Theoretical aspects of information system and information technology

Increasing information needs of organizational units require effective communication within the organization, and thus efficient information systems. In a market economy the competitive position of the organizational unit and the results of its operations depend largely on how quickly appropriate, and therefore needed information are received and processed. This requires continuous development and improvement of information systems, which are used not only to assess the effectiveness of management in the past, but allow in expected detail to anticipate economic and financial situation, as the effects of intentional, deliberate decisions of the management. Hence, their decisions taken on the basis of information can have a significant influence on the development of economic performance of business entities.

In the literature, there are several definitions of the information system. The *Mała encyklopedia ekonomiczna* (eng. little economic encyclopedia) defines information system as "(...) a set of principles, methods and procedures of creation, transmission, processing and storage of information in order to manage organizations or regulate functioning system. (...)"

J. Turyna[11] adopts in his work cybernetic approach to information system, according to which the system can be presented as a system of interconnected system environments, inputs and outputs, the system itself (considered as a set of components), the control system and the associated feedback[12].

These activities are essential elements of an information system, and can be represented graphically, as shown in Fig. 1.

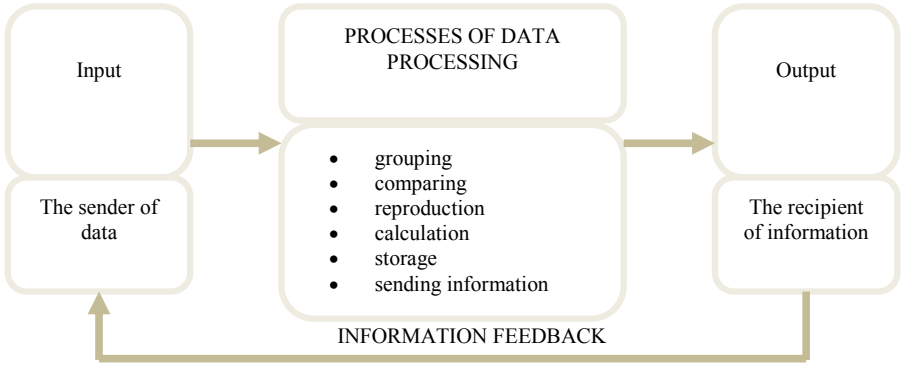

Fig. 1. Basic elements of an information system
Source: *IT for economists. Theoretical and empirical study*. ed. by Nowicki A., Scientific Publishing House PWN, Warsaw 1998, p. 37.

Properly organized information system can function only if rules of information processing are clearly defined[13].

Perfect information system should be simple to use, dose information for each user, protect data set, while quickly update the data and acquire new[14].

Contemporary social and economic changes, globalization of business processes, the growing importance of knowledge management, as well as the growing dominance of the service sector, contribute to the growing demand for relevant, timely information, and hence to the rapid development of information technology. This is a consequence of the increasing amount of management information, which led to the fact that without the support of information technology it would be very difficult, if not impossible to manage such a large amount of information[15].

In the literature, information technology (IT) is defined in very different ways. S. Benson and C. Standing[16] only define information technology in technical terms as: hardware, software and communication infrastructure to support the functioning of information systems. More broadly, information technology is a set of measures: computer hardware, computer networks and mobile technology used for the collection, processing, storage, data security, search, presentation and transmission. IT user has a set of tools by which he can acquire new information, select it, analyze, process, manage and communicate it to employees in order to meet their information needs[17].

In contemporary reality, information technology is actually considered as necessary tool for the functioning of the organization. It broke into all areas of reality, making the information reaching customers faster and more accurately, so one can more efficiently and more effectively perform the tasks assigned. It provides considerable support to the functioning of the units in the areas of: information system, management system, production system and social system[18].

4. The use of information technology in tourist IT systems

Tourist traffic in Poland is characterized by, among others, diversified generic and spatial structure and is not uniformly distributed in time. This causes adverse effects, both social and economic. One of the non-economic measures limiting this phenomenon of spontaneous tourism development, while shaping the movement in socially desirable directions, may be, in addition to advertising, tourist information[19].

Good tourist information news affects the size and structure of the genre, spatial and temporal tourism traffic. Tourism is the lifeblood of the economy, and the effective use of information technology by providing the basis for today's development and bloom of modern tourism. Information technology as the information backbone provides effective tools for both consumers and suppliers in the purchasing and distribution of tourism products. It can also be an important tool used for shaping tourism policy of cities and regions[20].

The use of modern information technology in established in early 2009 in Czestochowa Municipal Tourist Information System (Polish abbreviation: MSIT), provides many benefits for tourists and inhabitants of the city with its innovativeness and the national scale of the project to this day. The most important of these include gathering information about Czestochowa, its culture, landmarks, tourist attractions, current events and active leisure services.

The system is one of the major sources of promotion of Czestochowa, creating a positive image, and information kiosks being flagships of the city where tourism is one of the priorities of its development. They serve not only tourism purposes, but they are also carriers of cultural information and local authorities' news. Thanks to them, residents as well as tourists visiting the city are able to obtain access to the latest events, actions and public consultation organized in the city. Content, information banners and links to web sites displayed in information kiosks are presented simultaneously in many parts of Czestochowa.

Through information kiosks, users can not only browse MSIT tourist website, current news from the region, but also find interesting offers on the labor market, vote in the social polls, execute bank transfer, learn public information on a closed road in the city or find information on other important events.

However, to create such an extensive and multi-functional tourist information system, the use of modern information technology was necessary, and it would be impossible without it.

5. Management of hardware, software and network infrastructure

Established system provided the city with extensive technical and software facility, which together constitute a high potential to support the development of services for tourists and residents of the city of Czestochowa. It included the following elements:

1. Multimedia kiosks (with touch screen), in the amount of 54 have been placed in the most visited both by tourists and residents areas of the city. This area includes the entire city center, shopping malls, tourist facilities, bus and train stations and major urban communication strings. The system communicates with each of the information kiosks and retrieves data from the database deposited on a central server;
2. A dedicated tourist information web portal www.info.czestochowa.pl with detailed orthophotomap of the city of Czestochowa, available in information kiosks and in the Internet. Functionality of the portal software enables users to book services and updating the offer by the service providers;
3. The group of four Blade-type servers dedicated to support portal and information kiosks, which is the heart of the whole system, which hosts apart from the portal database, application for creating portal and software monitoring infostands.
4. The fiber-optic and radio network.

All information kiosks enable residents and visitors to use partially opened Internet. Network resources can be used to the extent to serve primarily the safety of users. Deliberately introduced barrier blocks all types of pages of not intended for display in a public place. Information on partial access to the resources of the Internet is presented

in the form of regulations – which is a welcome page, shown on the screen before using the information kiosk. Managing access to information (servers), and the information kiosks themselves can be performed remotely. This solution is shown in the block diagram in Figure 2.

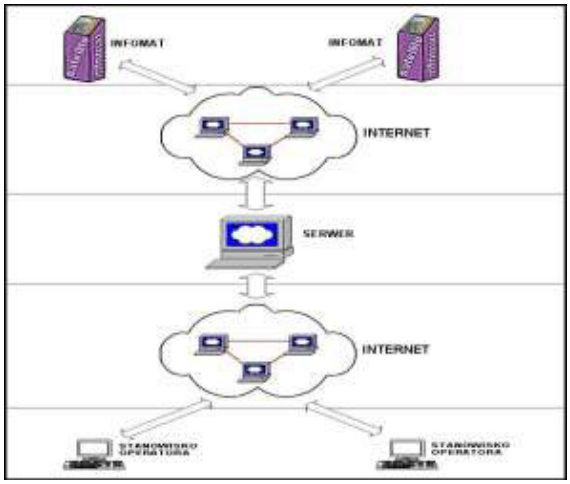

Fig. 2. Block diagram of the information kiosks management in MSIT network.
Source: Own calculations based on data from the Municipal Tourist Information System in Czestochowa.

Within the system, the following subsystems supporting infokiosks management can be distinguished:

1. Permissions / login subsystem.
2. The subsystem of managing data on information kiosks network,
   - SiteRemote software - monitoring the work of information kiosks, including among others working hours, failures, disk overflows;
   - managing the FTP server to store a copy of the network router configuration and log files of content filter.
3. The subsystem for acquisition of data from information kiosks.
4. Activity reporting subsystem.
5. The subsystem for logging of performed activities.
6. The subsystem for management of work of the technical department.
7. The subsystem for creation of installation packages for each version of the software.
8. Administrative subsystem,
   - Manage and update the content displayed on the MSIT website based on CMS (Content Management System);
   - ISDP management and configuration - new layers on a map of the city;
   - management of databases from SQL level;
   - management of access to MSIT resources from the outside and the internal network through the software router and firewall.
9. Subsystem informing on adverse events.
10. Subsystem searching for specific information.
11. Subsystem collecting of presentation and other materials.
12. Subsystem for downloading and viewing pictures taken during the operation of information kiosks.
13. Subsystem of remote commands for information kiosks,

Figure 3 shows an example of the appearance of the control of work management of information kiosks.

Fig. 3. Design of the system monitoring the work of information kiosks.
Source: Data from the Municipal Tourist Information System in Czestochowa

For the purposes of the Municipal Tourist Information System, the radio data network has been designed and built. The network is based on a double star topology, where a server room of the City of Czestochowa is a central hub. The first layer of any star is the fiber-optic network, which consists of 12 locations information kiosks. The second layer is a wireless data transmission network of Canopy system, to which 42 sites information kiosks have been attached. Network layers are separated only fictitiously. In fact, the two structures (optic and radio) permeates and complement, as evidenced by the mixed construction of a network backbone and the use of AP-MS radio spans as an extension of the last portion of a fiber optic link from a single information kiosk.

The solution uses the instruments working in the 5.4 GHz frequency ranges. The system consists of such infrastructure as: access points, SM subscriber modules and radio links enable routing of point-to-point (BH-Backhaul Module). The main element is the AP access point, which also provides a hardware connection to a network source (i.e. provider of Internet services). Angular range of one module that is installed on a AP mast is 60 degrees. It provides broadband transmission for up to 200 users. Solution using six modules has been shown in Figure 4.

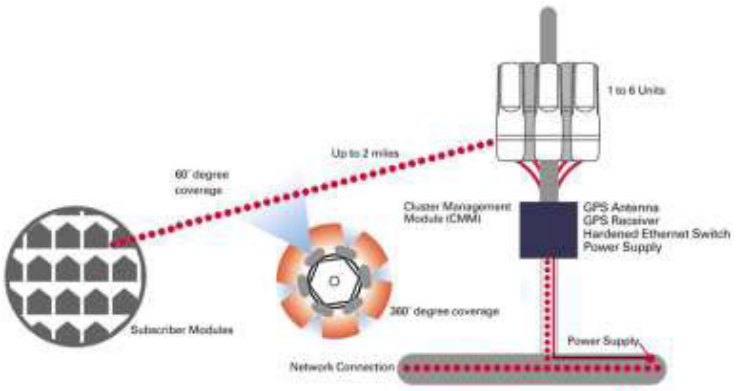

Fig. 4. Schematic operation of the AP module.
Source: Construction of radio data network for the operation of urban information kiosks in Czestochowa, Czestochowa 2008.

The achievable bandwidth between the access point and subscriber modules operating in the 5.4 GHz band is 7 Mb / s. used in the MSIT solution.

Custom authentication technique and signal modulation scheme used in the Canopy system, and two levels of the advanced encryption (56-bit DES encryption or 128-bit AES encryption.) guaranteed the system security and prevented access by unauthorized users.

Designed and manufactured system combines point-to-multipoint and is dedicated to work in the unlicensed band.

All installed system is managed from a single, dedicated software called PRIZM. Network of data transmission equipment have the ability to be centrally managed in the City of Czestochowa Office and locally by connecting a mobile computer, equipped with a dedicated management software. Each of the devices included in the radio network is visible and managed with the supplied software.

PRIZM software provides, inter alia, such functions as:

1. generating a list of all managed radio links;
2. collecting qualitative parameter values associated with the movement of the medium of radio and Ethernet traffic among others amount of information transmitted, rejected, number of errors, etc.;
3. monitoring the bandwidth of the radio link, the length of radio connection, propagation attenuation, modulation mode, the operating frequency of the transmitted and received signal level, the SSR (Signal Strength Ratio) parameter and others.

Figure 5 shows a logic diagram of management of information kiosks extensive network using fiber-optic connections, wireless and public networks. The management unit shall keep the system diagnostics of transceiver antenna and network devices.

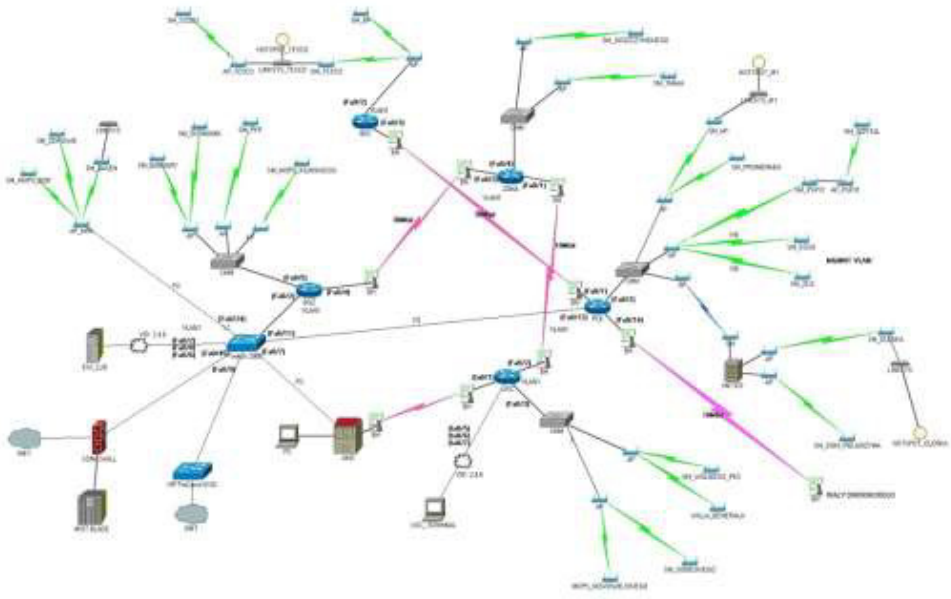

Fig. 5. Logic scheme of fiber and radio management in the MSIT network.
Source: Own calculations based on data from the Municipal Tourist Information System in Czestochowa.

Within the system, an extensive IT network deployed in all the important places in the city has been built. Its potential allows to enrich the functionality of information kiosks with new equipment and provides remote access through the public network resources additionally plugged into MSIT infrastructure using secure virtual private network VPN (Virtual Private Network). It is based on public data communication networks and computer systems,

which represent so-called private tunnels to connect internal networks (intranets).

A good example are ticket machines (vending machines) of the Municipal Transport Company in Czestochowa (Polish abbreviation MPK), which are already using information kiosks connection points. MSIT system managed to separate the MPK networks from the urban network, enabling collision-free operation for both ticket machines and information kiosks. This solution is shown in Figure 6.

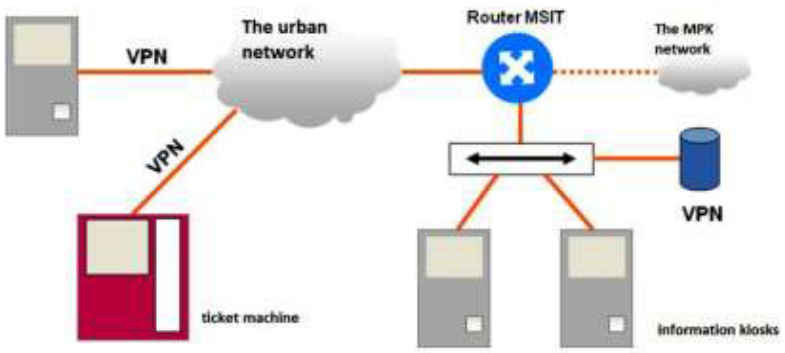

Fig. 6. Logical scheme of management of information kiosks connections in the MSIT network.
Source: Own calculations based on data from the Municipal Tourist Information System in Czestochowa.

The use of this solution in the near future will help to start the "check your ticket" service, which is to facilitate checking the validity of urban electronic monthly ticket, the reliefs passenger is entitled to and an electronic wallet account balance at any kiosk, which is equipped with a proximity card reader.

Thanks to the use of modern information technology system, you can run many useful and interesting services that are of great interest among tourists and pilgrims coming to the city. At present the system essential information function that is regularly improved and modernized.

6. Conclusions

Tourism is an important stimulus for the development of the city such as Czestochowa. Therefore, the provision of information services at a higher quality is increasingly important.

Therefore, the construction of tourist information systems using modern information technology has become an indispensable part of the promotion policy of cities and regions.

Presented in the paper information is an important factor to maintain the continuity of the whole system. This will enable the continuation of an efficient business information and promotion of the city, as well as allow for implementation of innovative solutions.

Described in the paper resources have been repeatedly enriched and modernized to meet the needs of users. Throughout the life of MSIT, statistics of using the system and information kiosks have been gathered. They helped to assess in which urban areas tourism is intensifying and where the activity of the inhabitants is the highest.

With several years of operation of the current system an interesting experience both in terms of used technologies and software can be drawn, and can be useful in the further development of the system.

Applied solutions have proven to be useful and helpful to tourists and residents, which is confirmed by the number of inquiries from the functions of information kiosks, which already exceeded the total of 320 thousand per year. They also contributed to the steady year-round use of the system, including information kiosks, which previously were used mostly in tourism and pilgrimage season, i.e. between April and September.

Presented results of the efficient use of infrastructure solutions for MSIT, could significantly distinguish the city of Czestochowa and become an example for other cities.

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